IMLS Convening
on
STEM Learning in Libraries
June 5, 2014

Chicago Public Library Commissioner Brian Bannon
Brian Bannon welcomed attendees to Chicago Public Library and opened the convening.

IMLS Director Susan Hildreth
Susan Hildreth thanked attendees for helping to inform IMLS grant making and advance work in the field. She noted that IMLS has been investing in STEM (Science, Technology, Engineering, and Math) learning for several years on a small scale, and it continues to be a priority. She proposed some possible questions to be explored throughout the day:

- What counts as STEM learning in libraries, and what are some STEM learning outcomes?
- What are the challenges faced by libraries working to foster STEM teaching and learning?
- Do all libraries need to speak the same language when it comes to STEM?
- What are some ideas and themes that guide how we build models of STEM learning in libraries?
- What do collaborative partnerships look like and what are the characteristics of their success?
- Most importantly, how can we think about bringing successful STEM programs to scale?

Session 1: What We Know and How to Translate: The Informational STEM Landscape and Opportunities for Libraries

Dennis Schatz (Moderator)
Beth Yoke
Paul (Wyn) Jennings
Connie Yowell

Beth Yoke noted that teens are struggling in educational settings, and there is conversation about how well the public education system is preparing youth for life after school. Characteristics of libraries that have been successful in meeting the needs of youth can be summarized in three broad areas: commitment, capacity and collaboration. Folding STEM into libraries is part of a larger movement of libraries adapting to meet the changing needs of today's society in the 21st century landscape. A commitment to change is the first step, which for teen services means thinking beyond homework help, summer reading, and young adult literature collections. Those three things have been traditional in core services for libraries, but that is not all it takes to get teens prepared to be successful in life and work. Capacity means being better prepared to make these changes to fold in STEM services. It could include alternative funding, flexible spaces, meaningful outreach, and being embedded in the community, because partnerships and collaborations definitely build capacity. Collaboration is where successful libraries have recognized that they cannot remain isolated institutions that are focused on being the gatekeeper of information and culture. They have developed meaningful partnerships in the community, which may lead them to experts in engineering, technology, and other areas.

Wyn Jennings framed his remarks from the perspective of the education section of National Science Foundation (NSF), which is deeply committed to enhancing the science literacy of the public and the nation. His focus for the last few years has been on rural education, and he has three experiments going on in rural libraries. One is at the Space Science Institute and puts hands-on, explanatory exhibits in rural

libraries. The second, from Dartmouth, is a sort of book club for adults with science, films and scientists as explainers. The third is in Maine and has to do with knowledge hubs, where the library is at the center of a given area with a radius that includes about 1,800 teenagers. This is bigger than a school, and the library helps them gain knowledge using everything they can think of, including libraries, computers, and businesses. In terms of issues, they include finances, from community support to the library itself; the setup for new ventures, including space; advertising, and getting people to come; and librarian capacity. We're advocating networks for them. Ultimately, we need more experiments, because there are a lot of variables, and above all, learning models.

Connie Yowell added a second funder perspective from overseeing a $150 million initiative that has deeply explored how young people learn through digital media. She shared five points on what the MacArthur Foundation looks for in funding proposals based on their research. The first principle for all its grant making is co-designing with youth, which is both about youth participation, but also about peer-to-peer engagement. If youth are not a part of co-designing the space, they don't own it, monitor it, regulate it, and engage other youth in owning it. The second thing is designing for interest and managing the hooks and the triggers that move kids from their initial interest to long-term engagement that connects to the real world. Most of MacArthur's work with libraries actually begins with music, fashion, or civic engagement, but may lead to studio engineering or coding. The third thing they look for is that libraries value their assets. It's about engaging young people in the remaking and the remixing of what is already in the library—books, maps, and music collections. The fourth thing is not to be caught in traditional conversations about outcomes, but help funders co-create them. We have the technology and tools to manage outcomes in ways that really amplify what can happen in the informal space. Lastly, no one organization can do everything, and learning in the 21st century is happening in networks. Libraries are the spine of cities and rural communities, the most important informal learning space that our government funds, and the most flexible institution that we have. Libraries should be leaders in the community, be open to taking risks, and lead this national conversation.

Dennis Schatz asked how we build the capacity at scale for librarians to be able to do these things, whether in the digital, maker, or general program arena.

Beth Yoke responded that we need to revisit graduate schools of library and information science; once professionals are out in the field, it's a matter of keeping those skills up to date. Continuing education is a huge piece in terms of building capacity, but we also have to look beyond library workers and recognize that somebody else in the community might have the expertise.

Wyn Jennings added that capacity is the single most important issue that will affect our outcomes. He hopes that new programming around STEM will generate more community support for libraries. It's a very difficult issue, but partnerships can help with some of it.

Connie Yowell noted that it's a question that every sector is grappling with. One of the things they're experimenting with is hive learning networks in three or four cities to create networked communities of practitioners. We need to establish opportunities for practitioners to have peer-to-peer opportunities, just like youth. Then we need create a volunteer infrastructure so that the expert practitioners have the freedom to do those professional development activities.

Dennis Schatz asked the panel what they would each do with $20 million if they were funders in this space.

Connie Yowell noted that she would first go to four other funders and leverage it to make $100 million. Then she would go to four tech companies to ask them to provide the technology, because philanthropic

dollars should not be funding hardware. The future of learning has to happen at the intersection of public and private partnerships. Part of the funding should support new visions of STEM learning in libraries, and some of it should be used to figure out and manage ways for everybody to participate. Then she'd make sure everybody was working on new indicators and ways to provide feedback to both the learners and the funders so that we can be clear that there's a sustained revenue stream.

Wyn Jennings seconded Connie and added that NSF is only funding around ten percent of the proposals that come in, which is much lower than it used to be. Since we can't afford to fund everyone, his suggestion is to put funding toward the best models.

Beth Yoke returned to the capacity issue once more to suggest letting go of tasks and responsibilities that are no longer needed. There is a need for a nationwide network to exchange ideas and share best practices, which would be a good use of funds. It could also provide a safe space for people to experiment and produce replicable models.

Issues/Questions/Comments from Group Discussion:

Paul Dusenbery: In terms of the capacity piece, there has been research on the uneasiness of some librarians towards engaging in STEM programs. Maybe it's not just the library staff, but it's also the directors of libraries who need to be brought in early to say that STEM is a good activity to pursue, as well as state and national library associations.

Beth Yoke: Part of that is framing the issue. It's a tough sell for anybody who thinks something new coming down the pike is going to be added to their plate of existing responsibilities. If it's more about doing things differently, that might be a more effective way to approach it.

Lynn Dierking: One of the things that the field needs to do is identify libraries that are already doing this work or have formed partnerships and leverage that knowledge.

Dennis Schatz: A study NSF is supporting made a more general approach to identifying people from the community that have the capacity to handle STEM areas, and they've been able to turn up a lot of people in communities.

Neel Parikh: One concern about capacity is related to Connie's comment on assets. People are running to the Make movement like lemmings and may not be thinking about it in the context of the value that we as an institution bring to the community. Can the panelists offer advice on how libraries can dip their toes into STEM?

Amy Eshleman: Connie once said that this work is about providing a context for the content, and that is where our real strength lies.

Connie Yowell: It's important to think about the role of the library and, whether Make or STEM, to really think about what the library's role should be in that context. One of the mistakes that the education community has made is to focus on content and outcomes and not focus on engagement and what learning looks like. For learners, what matters is solving complex problems that they care deeply about. Part of what is extraordinary about the library is all of its assets and connections to other institutions in the community. The library doesn't have to deliver everything, but it can connect kids to those other opportunities in addition to being their first point of entry. Lastly, there's a mistaken conception that what's learned in one place should transfer to another place. Our research points instead to the notion

of translation, such as reminding a learner that they know how to do scientific reasoning. Can the library create opportunities for that kind of translation to happen? There are lots of ways to think about what the library's role could be because it integrates multiple contexts and has so many resources both in the building and in the networked relationships that it manages.

Session 2: Short and Long Term Goals and Impacts

Dale McCreedy (Moderator)
Meg Escudé
Felton Thomas
Kirsten Ellenbogen
Lynn Dierking

Meg Escudé framed her remarks from experience in Exploratorium's Afterschool Tinkering program. There were a few stones thrown at Make earlier, and because it's become so popular, it's important to continue thinking deeply about what it is, how we're implementing it, and why. There's a misconception that if you throw a lot of materials out with an open-ended intention that kids will do what they want, that's enough. Experience shows that it actually requires a nuanced kind of pedagogy in teaching and support. We should spend a lot of time thinking about how to build capacity and teaching in a nuanced way. We find that kids that experience high stakes testing in their schools have a hard time transitioning to a project-based approach to education, and that means that they need a little extra support in what it feels like to come up with their own goals. Artists are really good role models to bring into these spaces because they're deeply motivated to push the limits of techniques and materials to reach their goals. Art also offers a crossover with literacy. Kids are motivated by the narratives they create around the things that they're making, and it involves a lot of writing, drawing and language use. That's one of the links that could be made with making in libraries.

Felton Thomas shared the city of Cleveland's experience, which went from a manufacturing powerhouse in the 1950s, to a city of diminished economic strength. The current city leaders decided to pursue manufacturing again, but in a different way. They honed in on two priorities: introducing manufacturing of 21st century technologies to all of the city's residents, and integrating STEM principles into the Cleveland schools. The library looked at how they could contribute, and in having conversations with the community they found two real barriers that are relevant to this conversation. Within the African-American community, which represents 50 percent of the population, there was a strong feeling that technology was important for their kids, but not nearly as important for them. Secondly, young people were not generally tied to technology, except for their cell phones. As a result, the library had to find ways to target programming to kids in a way that the parents could also attach themselves to, and programming had to incorporate cell phones.

Kirsten Ellenbogen picked up from Felton's points. One of the things that worked well in Cleveland has been to create activities that allow partners to belong to something in common before committing on paper to what they believe in common. The Cleveland Maker Faire is one example of that, where many organizations came together as a way to start the conversation. They recently mapped out existing resources and activities among more than 30 regional organizations, which sometimes has to happen before moving into shared outcomes. The Cleveland Plan, which is a transformation plan for the public schools, has also brought the community together. Even with these shared conversations and ideas, though, it's still hard to come up with common goals across the community. Thinking about the IMLS strategic plan and its focus on community anchors, IMLS might do well to encourage grantees to make their role as a networker or hub a set outcome, which would make the community anchor work more specific and productive. Then, in looking

at the learner at the center idea and IMLS as a practitioner-driven federal organization, the agency could play a central role in practitioner-driven research agendas that point the broader community towards research outcomes.

Lynn Dierking posed a question around transfer and translation, mentioned earlier, and whether we can create a system where youth cross-leverage resources, which would really put them at the center. A lot of current research shows that youth are not able to take their identities from setting to setting. They may have rich science lives, even if they don't call it science, but they can't even bring that expertise and identity into school with them. Libraries are really well-positioned for this work, because they are embedded in neighborhoods and have amazing resources. Instead of a deficit model that emphasizes kids' needs, it's important to frame this work around the assets that youth bring. IMLS should consider three funding priorities in terms of practice, research and policy. First, it would be interesting for IMLS to try and synthesize effective practices within libraries that successfully support STEM interest and pathways. In terms of research, we still don't know enough about how youth navigate through communities to engage with their interests and how that can connect to STEM. Are libraries a part of that, and if so, how? In terms of policy, it would be helpful to have convenings that bring together legislators, association leaders, business, government, and higher education, to really highlight the work that is being done in libraries. It's not always understood.

Issues/Questions/Comments from Group Discussion:

Gretchen Walker: What are the panel's thoughts on both the possibilities and the pitfalls in trying to link to the current standards movement, when thinking about impact?

Meg Escudé: What's interesting about the new Next Generation Science Standards (NGSS) is that they do attempt to get at real practices. The potential pitfall is to try and fit the practices to the standards rather than look for the standards in real practices. The challenge is to make sure we're designing activities that are really authentic.

Lynn Dierking: There was very little – perhaps just a paragraph – in the NGSS about out-of-school and informal science learning. Politically, we're not at the table, and it's a bit of a dicey issue. Do we jump on that wagon, as we have jumped on many wagons: performance based assessment, competency based assessment, etc.?

Kirsten Ellenbogen: We find that NGSS provides a way for us to point to some very successful practices and to push out the importance of our role as non-school organizations that still focus on education in the community. There is a role, but you may have to look for very particular models to push that forward.

Gil Noam: Is this a discussion about STEM in out-of-school spaces, which is a known discussion, or is this about the added contribution and the specific issues in libraries in regards to STEM? Connected to that, are we talking about STEM equally or about specific components that are more connected to the library world?

Felton Thomas: As libraries we have to recognize that we can't do all of it on our own. We have to find partners and then we'll have an opportunity to do different activities in a way that incorporates science.

Meg Escudé: Libraries are already doing the things that are needed to support this kind of STEM learning in libraries. A good library is already paying attention to the needs of its community and already serves as an alternative space where kids can go and learn in a way that doesn't feel like school.

Dale McCreedy: Part of this is about beginning to model and build advocacy for science learning and recognizing that adults are the crucial intermediaries.

Ellen Lettvin: In this era of democratization of content, where everybody has a blog or video on YouTube, it's important to also think about a role in co-creation for a moderator or curator.

Lynn Dierking: In terms of curatorship, wouldn't it be great to empower the learner to assess whether any given material is good evidence? Hopefully we're ultimately thinking about trying to create STEM-literate people.

Wyn Jennings: It's been alluded to that a segment of people between the ages of 18 and 45 have a great influence, and we're probably not targeting them as much as we could, and we could reap benefits if we did address that area.

Felton Thomas: We have found that without getting our youths' parents or caretakers involved, it really limits the amount of their learning. Until parents feel comfortable with it and willing to talk about it with their kids, young people are generally intimidated by it.

Meg Escudé: Let me advocate quickly for that 18 to 25 age range as mentors and facilitators in this space.

Session 3: Models for Programs and Scalability Challenges

Margaret Glass (Moderator)
Paul Dusenbery
Darrell Porcello
Kate Haley Goldman
Reed Stevens

Margaret Glass opened the panel with some comments about the Learning Labs in Libraries and Museums, now in year three. As the program rolled out, there were questions about models, not only in creating the initial program guidelines, but in supporting the grantees. For example, what if only parts of a model take hold – is that spread or scale? How do you know when you've achieved scale through a spread of your models? A recent paper by Cynthia Coburn, at the School of Education and Social Policy at Northwestern, provides a conceptual framework for spread and scale, specifically in a digital world.

Paul Dusenbery shared his perspective working on the STAR Library Education Network (STAR Net) over the past several years. When it comes to STEM activities in libraries, it really comes down to the quality of the experiences. You can't just hand-feed individuals a topic that you feel is interesting; it has to come from them. The quality of strategic partnerships is also imperative, and libraries have to reach out to their communities in a very strategic way if STEM is going to take root. John Baek was mentioned earlier, and he has written two wonderful foundational research papers available on the National Center for Interactive Learning website. One talks about the library as an institution engaged in STEM activities, and the other addresses library staff. In terms of STAR Net, it's a national model that was funded by NSF, and it's reached almost every state. The components include a set of museum-quality, interactive, hands-on traveling exhibits; active learning activities; a comprehensive training program through online and in-person formats; as well as research and evaluation. The programs are impacting not only young people, but also the whole community. In terms of recommendations, IMLS should promote the value of STEM throughout the library

community; provide best practices in effective STEM-related professional development; support a variety of STEM learning models; and consider a national conference to bring together the STEM library professional community and STEM professionals to discuss how they can work together more effectively.

Darrell Porcello talked about STEM Open Educational Resources (OER) and how to present them, organize them, and make them available to educators and librarians. His work in this arena started with howtosmile.org, an NSF-funded project to create a digital library for informal educators. It was built on the infrastructure of the National Science Digital Library, as was NASAwavelength.org, which has educational resources funded by NASA, and informalscience.org, funded by NSF through the Center for Advancement of Informal Science Education. These projects involved many lessons learned about resource management, and out of that grew four essential components to STEM OER success. They are:

- convergence towards common metadata, which matters because many funded projects create online collections and standardized vocabularies can aid the learner or educator;
- balancing expert and community definition of quality;
- interoperability, so various collections can talk together; and
- archiving.

In terms of a STEM OER SWOT analysis, there are Strengths (resources are free, easily accessible; fuels a mixing-matching culture), Weaknesses (will they be there tomorrow?), Opportunities (someone to organize them; badges and standards applied to OER; archiving), and Threats (educational startups that are potentially going to police and then create barriers to this content).

Kate Haley Goldman commented that IMLS is taking this river of learning and panning for gold, in the form of the types of models seen here. There are some issues that we should be considering when we look at models, which could also be called criteria for an IMLS review panel. STEM in libraries struggles with three basic things. The first is culture. The language that libraries use in their missions is about how to serve, but individuals have different needs, and libraries are perhaps the most self-directed of learning institutions. Then there are the needs of the community, which these models should also address. So the biggest criteria for this imaginary review panel would be how does each model adapt to each community, and does it come with a culture and vocabulary of libraries so that we know that it will have some sort of success? The other two issues are around logistics and adaptation. Do the models that we're using have the resources needed in order to make them a success? If the library is going to serve as the spine of the community, then it's not going to be simply a house for what we know works elsewhere. How have these grants taken the unique resources of libraries and applied them to those particular models?

Reed Stevens shared the model of FUSE Studios, which are about interest-driven STEAM exploration that levels up like the challenges in a video game. They're happening in public library, afterschool and school settings, and the goal is to expand participation to kids that are not already interested in math, science and technology. One of the mottos in FUSE is failure is just another try. Youth have control of their challenges and pacing, and there are many layers of help from adult facilitation, web based tools and online mentoring. FUSE fits with the re-conception of libraries as places of production and provides entry points to more open-ended experiences in makerspaces. It's organized to fit cultural use patterns of libraries, whether individual or group, short term or long term. The challenge to scalability is a real question for FUSE, but putting scalability out there may be putting the cart before the horse. We first have to think about challenges to local implementation and local adaptation. Finally, in terms of the capacity issue, librarians do need some specific training for FUSE. While STEM content knowledge is not required to be a good FUSE facilitator, being able to guide initial and ongoing engagement is. Librarians fit the FUSE model because they're accustomed to helping people find resources around their interests and acting as guides.

Margaret Glass turned to the audience for questions and comments, noting that it would also be helpful to hear what funders need from some of these projects that have created successful models.

Issues/Questions/Comments from Group Discussion:

Paul Dusenbery: The key thing about a model is that it morphs into something that will be relevant and useful for a wide variety of audiences. It's also critical for us to solve that burning question about how we can impact the underserved audiences of the country that are just thirsting for great activities and inspiration but have few resources and partners.

Darrell Porcello: Agreed, and is it really that we're just looking for more good models, or is it the fact that we have some really great models and we just need more potential funding to scale up? Digital libraries can be very practical, because they at least get some of the best practices and resources into the hands of people that might be motivated, including librarians.

Lisa Perez: Are there any models where you worked with school librarians?

Margaret Glass: Among the 24 Learning Labs, many do work closely with the schools in their districts, as well as across library-museum boundaries.

Reed Stevens: FUSE just started to move into schools this year, but librarians have been identified as some of the most likely people to help with it.

Sandy Toro: IMLS just made an award to a researcher at the University of Oklahoma who is studying a learning lab in a school library as well as an IMLS learning lab, to see what the learning looks like within those different spaces and what the commonalities are across them.

Angela Brade: The Howard County Library System in Columbia, Maryland has a very strong partnership with the school system, called the A+ Partners in Education. We collaboratively come up with the curriculum.

Dale McCreedy: It's not just about STEM. It's also about collaborations, cross-content areas, and trying to figure out how all these pieces come together and have salience within different communities. We have to make sure that we find the right balance between flexibility and fidelity of implementation in such a way that isn't so rigid it can only be done one way. This is about a community of people, of learners in general, and STEM more specifically. It even calls into question whether there should be strands for libraries and museums, if we're really thinking about ecologies of learning.

Post-Lunch Update

Robert Horton talked about upcoming changes to the IMLS National Leadership Grants program, which currently puts out a very broad call for the best and brightest ideas in the field. IMLS is increasingly concerned with the need for proposals that move the needle on some shared goals, such as those discussed here. This convening will contribute to new guidelines that are more focused so that IMLS can better demonstrate impact. One of the new developments will be a second deadline in October (existing deadline in February).

Session 4: Conversation with the Director – City-wide STEM

Susan Hildreth (Moderator)
Beth Swanson
Brian Bannon

Beth Swanson provided a broad overview of Chicago's City of Learning and STEM strategy. When they started looking at workforce data in the region, over 400,000 jobs were STEM based with over 60 percent requiring education beyond high school. They also looked at how they were preparing students, and of the 30,000 that move annually from eighth to ninth grade, only a projected 1,200 to 1,500 would obtain the needed credentials for one of these STEM jobs. That's a huge gap, so they set a goal of tripling that number by 2018. The city created a big strategy around three major areas. One is improving teacher capacity to deliver STEM curriculum, another is improving STEM academic readiness, and a third calls on industry partners to step up work-based learning opportunities and corporate mentorship for students. A second highlight is the Chicago City of Learning initiative that also launched a couple years ago in partnership with MacArthur and the Mozilla Foundation. They wanted to capture all the student learning taking place in the city and also address learning loss during school breaks. They introduced the concept of digital badging last summer to capture learning outside the traditional system. DePaul University recently announced that it's going to start using some of the computer science badges as part of its admissions process. It means the badges will not only incentivize learning but serve as a real currency.

Brian Bannon added that as the Summer of Learning was being imagined for the city, the Chicago Public Library was also looking at its traditional summer reading program and related research. They realized that they were only addressing one piece of the problem of summer learning loss. They redesigned summer reading for a couple of reasons. It's important for parents to understand how to engage with their child around learning, and the library is a great place to model how to do that. They also wanted to incorporate indicators of success for summer slide reduction, such as reading 20 minutes a day. Last summer, the library experimented along with the city and gave kids credit for learning through the badging system. This summer they're refined their approach and are taking it even further. A local elementary school has signed on to make this curriculum a requirement and will give kids credit for their summer learning. In addition to reading and discovery badging opportunities, kids will have opportunities to do engineering challenges. The result is that they're bringing in more kids, families and participation, and engaging with users in a much broader way.

Susan Hildreth noted that she sometimes hears questions about badging. Is it really going to work? Is it too early to think about? Who is vetting the competencies for the badges? She asked whether the panelists get questions like this, and if so, how they respond to them.

Beth Swanson responded that, two years ago, it was a new term, so they started convening not only city agency personnel, but nonprofits, cultural institutions and others to talk about badging. They covered why it can be helpful, why kids are engaged by it, and how to actually develop a badge that carries with it real information: the skills acquired and the standards attained. As one example, several institutions got together to create a stacked series of badges that would provide a veterinary pathway. Organizations saw the worth to their own programming, and it just started to organically move.

Brian Bannon added that badges are like any kind of currency, with some that are more valuable than others, and there are still a lot of questions to be answered. One thing the library is interested in is what a badge can ultimately get you, as a kid, such as extra credit at the end of summer. The other thing the library is interested in is interventions at the library that result in a change in skill, attitude or behavior. One of the behaviors that they really wanted to incentivize throughout the summer was reading 20 minutes a day.

Issues/Questions/Comments from Group Discussion:

Keliann LaConte: For those of us here today, is there a way that we could do something like what Beth described in terms of different institutions getting together and connecting curriculum?

Susan Hildreth: We can share participants' contact information, and that kind of convening might be something that IMLS or an affiliated organization such as ASTC or ALA puts together.

Brian Bannon: In Chicago the convenings allowed different institutions to bring their best thinking and curriculum together, with facilitated opportunities to help translate that into badging. The approach of learning together and sharing best practices resulted in a better product.

Susan Hildreth: Also check in with YALSA, which has done work on badging in terms of librarian competencies.

Felton Thomas: This work is commendable. How do you get a mayor involved?

Beth Swanson: The convening power of the mayor's office was incredibly helpful, but it can be done by other leaders in a community. Some cities have a sort of nonprofit youth intermediary, like Big Thought in Dallas. There are different leaders stepping up in different communities, and there's no reason a library could not play that role.

Brian Bannon: Agreed. It definitely helped to have the city momentum, but an individual library could model this approach for a community.

Gil Noam: If badging is like a certificate, how do you take it to a place where you can say there's learning that has happened and really track it, in terms of process?

Brian Bannon: Badging aside, there's been deep work done in this area already, in terms of approaches to learning. In some approaches, you can demonstrate mastery of a set of skills by individual self-directed learning. If someone can see that you've actually completed a set of activities, that's another way of demonstrating that you've learned a skill. The challenge, as with any sort of learning, is determining the quality of learning and who is issuing the certification. If you do create a set of standards and bring together the convening power of the providers, you can create that as part of the system.

Session 5: Diversity in STEM Programming

Sandra Toro (Moderator)
Angela Brade
Melissa Ballard
Jennifer B. Lyle

Angela Brade talked about Howard County Library's STEM-focused High Tech program, which was part of the Learning Labs grant. They noticed when they kicked off that they were a little light on female participation. With input from girls in the community, they incorporated a fashion component that was STEM related. The 12-week class taught participants about fundamentals such as colors, about how to

use Adobe Illustrator, and about fashion-related careers. Now the program's female participation is up to 45 percent, and the program's demographics evidence overall diversity. Some of their other content areas have included game design, mobile app design, technology tools and music, 3D animation, green energy, robotics, math inquiry, infectious diseases, nanotechnology, and DNA analysis. They're not just introducing STEM, but helping participants understand the context. They have paired classes with the school curriculum and secured internships for some of the students. In terms of diversity, her advice is to be very broad in sweep, to listen to students, and to approach them in innovative ways. High Tech engages the community, the school system, and the colleges for staff instructors. They are interested in people who unequivocally love teenagers, and not just work with them, but want them to learn and be successful.

Melissa Ballard framed her remarks from the Afterschool Alliance perspective, which is a national advocacy and policy organization that also does research. The Science Club program in Chicago uses a model where the peer mentors of participating youths are practicing scientists, and this is a specific strategy for engaging low income youth, youth of color, and urban youth. There are some conversations from the afterschool field that are relevant for libraries as they start thinking about offering intentional STEM programming, especially around creating a more sustained interest in STEM. Recent research from Kings College London confirms that youth mostly have stereotypical views of who does science and is good at science. Despite any underlying interest in science, youth still can't quite see themselves in those careers. Angela Calabrese Barton out of Michigan State has shown that after three years of engaging in authentic science practices in the GET City program, youth come to develop a certain type of identity, which she terms the community science expert. This is another kind of strategy for engaging youth of color, underserved youth, and low income youth. What's really key is that they're also developing confidence. The afterschool field is settling around the idea that youth development expertise is its asset and that STEM is just a lens for achieving broader goals.

Jennifer Lyle spoke from the perspective of community change and community development, with her most current work in Richmond, California, the home of Rosie the Riveter and Kaiser Permanente, which built ships during WWII. She shared three points on youth and diversity. One is that many of the young people in their programs have challenging experiences with educational environments and public institutions. The consequence is that they often don't want to enter those environments. A second point is that for these youth, learning has been primarily focused on navigating life. It involves getting food for the day, immigration issues, housing issues. Librarians are overwhelmed with all of the needs that young people and families are bringing to the library, and they haven't necessarily been supported to help navigate those things. A third point is that the learning needs to be relevant for these youth. When asked what they wanted to learn, young people in Richmond said that when there's a shooting in the community, they wanted to know the safe places and the streets that would be blocked off. They wanted to know how long the bus would take to arrive because it's never on time, and they wanted the evidence of their bus being late to share with their boss. They wanted to know how to grow food, because it's too expensive and difficult to get fresh vegetables. These are all things that are teachable and relevant to their world. There is a need for a different perspective in the way science is growing, and that voice is really missing.

Sandra Toro asked how IMLS can support more librarians to connect with others in order to develop strong proposals and projects for at-risk youth.

Angela Brade responded that the proposals that librarians create have to involve the community. That means meeting them in their own cultural reference, including them without judgment, and really talking to

them. Sometimes, by getting caught up in treating a certain group a certain way, we actually treat them unfairly.

Jennifer Lyle noted that diversity needs to be integrated into every component of a program because there are young people and families in every community that face economic and social challenges. It takes being deliberate about how to advance and broaden the library as a resource.

Melissa Ballard suggested looking at other models of how afterschool programs have woven STEM into various disciplines. You can certainly have other components that aren't STEM specifically, but figure out how to have some level of rigor in STEM within that larger program. Then, work with partners to develop that aspect of STEM programming that you might be less comfortable with if you don't have STEM expertise.

Jennifer Lyle added that it's no good to have a program that's going to last for a year and that you can't sustain beyond that time. That's almost a disservice to people, to be able to have something fabulous that they'll never see again. So incorporate some thinking about how to leverage other resources to sustain a program that could eventually become institutionalized.

Issues/Questions/Comments from Group Discussion:

Question: One of the key audiences of our small STEM nonprofit ends up being kids with autism who do really well in the sort of program we offer. What are panelists' thoughts with respect to that aspect of diversity and STEM programming in informal settings, particularly libraries.

Melissa Ballard: It's certainly an important part of what we include in our definition of diversity, and we also should include it in rural programs as well.

Sandra Toro: There was an article referenced at the National Research Council summit yesterday called Unlearning Disability. It's a recently published piece that tracked kids who had certain kinds of challenges, and those diminished in informal settings.

Angela Brade: In your local community there may be an association that focuses on autism, like the National Autism Society. They're always a good starting point for partnering on something or exploring options. The public school system can also play a role, because sometimes special needs students are integrated into the school system and the teachers are familiar with resources.

Paul Dusenbery: Many students are probably pretty proficient in English, but what about barriers to interacting with their parents, caregivers or family members when you're developing programs?

Jennifer Lyle: Spanish is now more common in our community than English. What we've learned is that folks need to be able to communicate with parents in the Spanish that's comfortable for them. We don't necessarily have flyers, because a lot of people are not readers, but we have people that can speak to parents. So we are learning more about how to communicate with parents and bring parents into it, because they are very important.

Melissa Ballard: A lot of comprehensive afterschool programs already have strong ties with families and communities. The programs that are STEM specific aren't perhaps as experienced with that piece of it, but they are finding that the family engagement piece is very necessary.

Question: It sounds like a number of STEM programs rely on bringing in people from the community who have STEM backgrounds. Can you speak to whether communities have equal access to that kind of resource, and as you end up bringing in folks from outside the community, how that works out?

Melissa Ballard: Certainly you find a wealth of resources in the urban areas, but there's still an element of training mentors and volunteers. It's much more challenging for rural programs to figure out how to pool resources, but we were talking about an example from Maine at the National Research Council summit. There were people in the community; it just took a lot more work to get those people together.

Jennifer Lyle: An organization that we work with, Black Girls Code, focuses on bringing coders or folks who are involved in that technology into communities. Then, the girls get to see people that they would ordinarily never have contact with, and they start to see that there are people outside of this community who have an investment in us. They're also starting to have a different understanding and concept of civic engagement, so there's a real value to bringing in volunteers.

Meg Escudé: In terms of what Jennifer mentioned about Kaiser historically employing folks of color in Richmond, have you found ways to include that history in some of the dialogue around STEM careers?

Jennifer Lyle: It's starting, but there's not yet a broad community conversation about what's going on in Richmond, and how it's been established. Some people of our generation didn't know that their parents built those ships. So it's part of the conversation that we're trying to get the schools to talk about and get the city more engaged, because there's value.

Sandra Toro: Angela, could you talk a bit more about the technological tools that you've used? What works, and what keeps kids engaged and coming back?

Angela Brade: One thing that happens is that youth know what's popular in terms of games and mobile apps, so they come in wanting to learn how to make a mobile game, and we offer JavaScript or C++. We originally didn't offer 3D design when we started out, but the youth requested it. There's also Arduino for the robots, PHP, a litany of open source and some proprietary software. What we use as a guide is what's out in industry. The young ladies who learned Illustrator could get a job right now at Kinkos or a design house because they use that technology. So that makes it real and relevant to them.

Felton Thomas: This is a loaded question around library service, but how as a librarian has that had any effect on your ability to be able to work with people of color?

Angela Brade: It hasn't. Actually, I don't have a librarian background, but we have diversity within Howard County Library System. When we focus on education, we look for the best. What we want is someone who really relates to youth of all colors, and who makes sure that they can communicate the context very clearly.

Jennifer Lyle: One of the challenges in our community is that librarians are overwhelmed, and there's an assumption that you need to be the same as another person in order to understand them or interact with them, and that's not always true. But you need to care about these people that are coming to you, and you need to have a commitment to being of service to them, because that's the job. It was very difficult for some of the librarians, because of fear, anxiety, and being overwhelmed, but they reached out to us and we began to partner with them to help them navigate.

Session 6: Roles of Staff and the Preparation of Librarians and Archivists for the Informal STEM Landscape

Andrea Sáenz (Moderator)
Cat Greim
Mary Nelson
Jennifer Nelson
Suzie Allard

Cat Greim shared the model of Iridescent, which is a nonprofit STEM education organization. They train professional engineers and scientists to develop STEM education design challenges with simple household materials that can be done at home or in libraries. They also train parents and partners to use the curriculum in libraries, schools or at home. Curiosity Machine is their free online platform that offers a menu of design challenges and connects scientists and engineers to youth. Once participants upload their projects, mentors from STEM fields respond with ideas to improve their designs, encourage them to persist through failure, and reinforce basic scientific concepts. For Curiosity Machine, they don't need librarians to be STEM content experts, because the layer of online mentors helps support them in that capacity. What they do need librarians to have is comfort leading open-ended design challenges that may not have very specific instructions or one right answer. They need to be able to ask good questions that will guide students along the path to refining their design and gaining critical thinking skills. Finally, they need to have general comfort in using digital platforms with youth. One of the biggest challenges in the pilot last summer was around simply uploading content to the site and getting to that other side where mentors can respond to them.

Mary Nelson noted that in the Las Vegas-Clark County Library District they started working with STEM through one branch that was part of the Las Vegas Science Festival, which grew into a district-wide conversation. It will be important to take back the idea that librarians aren't expected to be the content experts, because they're finding that their staff can be overwhelmed by that challenge. It's much like early literacy where staff understand that they're not teaching reading, they're teaching the love of reading. One of the things they want to tackle this coming year is how to make partnerships really effective. Especially with the economic challenges, there are so many people in the community that want to partner with a library, but which partnerships are really going to move the needle? It would be great to have IMLS help convene stakeholders in terms of the library being the spine, which came up earlier, and being at the table just like with early literacy. Partners may know about libraries, but even some partners don't know exactly what libraries can bring to the table. When staff knows what their value is, that's when it spreads out into the community.

Jennifer Nelson noted that public libraries are political organizations, and asked how we understand that in terms of a library's capacity to do something that's innovative. With STEM programming there is the potential to create new staff roles. As librarians retire, communities are faced with replacement decisions: do we hire an MLS librarian or somebody who is good at building community partnerships? This is a great opportunity for IMLS to help libraries retain relevance for the community. One of the beauties of being an informal learning environment is that libraries don't have to be tied to standards or youth development goals, but they do need to be tied to something. IMLS can help by ensuring that funded projects are addressing and tracking outcomes. IMLS can also bring together people from the informal science world with libraries and youth development. The fundamental notion of science learning being about creativity, exploration and inquiry is what libraries do every day. Librarians know

how to ask questions, how to prompt people to ask better questions, and how to help them observe what they're seeing. A final pitch would be coming up with a manageable STEM literacy equivalent to the early literacy program, Every Child Ready to Read.

Suzie Allard posited that STEM literacy is really lifelong learning, so in addition to thinking about kids, we need to be thinking about other age groups. Open data initiatives that are coming down the pike put a much larger onus on scientists than ever before, and librarians are uniquely positioned to solve that workforce problem of helping and handling data. There are embedded librarians already interfacing with scientists, so why don't we work on those networks and pull them in? We need to embrace the many names that librarians have come to be known by so we can call on the network living outside of traditional libraries and have them help us. We need to facilitate across STEM communities: the professional, the amateur, and the nascent scientist. What kind of activities can IMLS help support? From a continuing education point of view it's the facilitation skills, intercultural skills, and community outreach. Convenings could also bring together librarians in science intensive organizations with public or school librarians. Finally, science literacy is very closely tied to citizenship. When you talk about citizen science, where people are contributing observations, it is a form of citizenship, because they are participating in the good of country.

Andrea Sáenz asked whether we're at a place where we're saying that librarians need to know how to be STEM educators. Or are we falling short of that?

Mary Nelson responded that what's important for librarians to know is the language of STEM. We have the skills to get kids interested in the programs that we're offering, and there's no lack of enthusiasm among their staff for trying these new things. But, they need to have enough of the language that they can really affect those community partnerships, be able to talk to educators, and know that they are bringing value.

Jennifer Nelson noted that giving librarians an opportunity to be co-learners with kids can be very powerful. For librarians and STEM, it's important to know how to determine who a good partner is, and whether, for example, the outcomes the science museum is articulating for a program are really meaningful. In smaller communities this might also be relevant in terms of bringing on volunteers that can offer something meaningful to patrons.

Andrea Sáenz asked Suzie about what library schools are doing to prepare the workforce.

Suzie Allard suggested that all schools are examining their curriculum on a very regular basis and working diligently to hear from the field. Most also have an advisory board that discusses what alums should know as they leave and what graduates need to know as they enter. The vast majority of schools are centered on teaching process rather than content, and there are a lot of passionate people coming into schools that are ready to fill these spots. Many programs discuss community engagement, understanding the politics of being in a community, and relationship management. Still, schools could probably have greater dialogue with all of those who are working out in the field.

Issues/Questions/Comments from Group Discussion:

Kim Kwang-wu: STEM education in this informal environment is mostly hands-on and project-based learning, and in this kind of informal learning, information literacy instruction is critical. That's something

libraries can provide uniquely compared to other institutions. There aren't many research studies about the effectiveness or significance of information literacy learning in STEM, but that's a gap we need to fill.

Andrea Sáenz: To what extent should we be, or are we, rethinking staffing models in libraries? How well are libraries set up to do this work as they are?

Mary Nelson: We have to look at what libraries can let go of that we have traditionally done. Maybe summer reading gets tied into STEM. Is there some compensation for library staff with these skills that is above and beyond what we currently offer?

Jennifer Nelson: Where I'm seeing a real shift is in the awareness that in order to retain our role as part of the community learning ecosystem, we have to be out in the community. We can't just stay behind the doors of the library. The flip side of that is the question of what a library looks like, and learning labs are a great example of that. We are seeing youth workers coming into libraries as a product of partnerships, but what it's going to look like overall is still emerging.

Cat Greim: From the partnership side, some of the branches that had the most success running Curiosity Machine last year had just one additional adult in the room to attend to the tech side of things. There was a fellow in one instance, there were some trained parent volunteers, so even beyond staffing, thinking about creative ways to engage other people in specific programs to help support library staff could be a good strategy.

Suzie Allard: Turning back to history, there was the traveling court judge who went through multiple counties. The question is whether we assemble some sort of a flash team of information professionals that are science literate for certain regions. I don't know that we've ever really explored that kind of option of having a core set of expertise that travels.

Question: What is the unique puzzle piece that would really celebrate and respect the uniqueness of libraries? Is there something that we're missing that would only be possible given the expertise you guys have, and the space that you're in?

Jennifer Nelson: Public libraries have a kind of spread with over 17,000 of them across the county, and in rural communities, they may represent the only organization that has publicly accessible bandwidth.

Suzie Allard: I think one thing that can't be underestimated is the level of trust that people have in libraries. Social capital is something that's incredibly important. We don’t do a good job of marketing ourselves or what we do well, and this is a failing in our education.

Andrea Sáenz: I'm not a librarian and I've been blown away the last year and a half at Chicago Public Library with what our patrons tell us about why they choose to come to the library. The really unique feeling that people get walking through the doors of a library is that they're totally welcome, that nobody is going to judge them, they're not afraid to ask a dumb question, they're not going to be evaluated. They feel very open to learning things that they otherwise would probably be too intimidated to try. On top of that, it's available to all ages.

Angela Brade: I gave a presentation about the library to parents recently and they had two complaints. One was that we undersold ourselves, and number two, no one knew. That was the best compliment. It's good to be unique, but what matters is whether you’re the best.

Comment: The biggest dilemma for libraries, and for those of us partnering with you, is whether you want to let a lot of flowers bloom—which sounds like where things are going with a lot of the presentations—or whether you want to work towards curricula, approaches and practices that can be rolled out in a larger way. If you want to stay more with a community-based approach where things rise to the top, you will have to create a very good framework of quality. Then, you'll have to have professional development around the data-driven results that give you a sense of what works and what doesn't work, so that you can raise the quality across the board.

Jennifer Nelson: That's the support we need from the informal STEM community. Libraries don't have a really strong tradition of measuring outcomes, and that's where we need a lot of help.

Comment: Just asking the right questions is a literate practice. If libraries could even help parents, afterschool providers or teachers, by modeling how you engage with the STEM professional and learn to read the unknown, that alone would be a great thing to educate people about.

Suzie Allard: Kids are really good at code switching, which is being able to use the terminology they need to use in the proper setting. Being in the science world is a matter of code switching or moving between domains. Libraries are uniquely positioned to do that.